



## **The surface mass and energy balance of Nordenskiöldbreen, Svalbard: 7 years of in situ observations.**

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In spring 2006 a climate monitoring program on Nordenskiöldbreen, Svalbard, was initiated, which is still on going. The program focuses on the dynamics and mass budget of the glacier, and includes mass balance (stake and sonic height ranger) and automatic weather station (AWS) observations.

The annual mass balance observations show large variability and no trend over the observational period (2006-2013). The equilibrium line altitude (ELA) during this period is located at about 610 m a.s.l. This is in line with the average ELA over the period 1989-2010 of 631 m a.s.l. based on output of a distributed energy balance model (EBM), and slightly higher than presented in literature for this area. At the AWS site ( $\pm 600$  m a.s.l.) the average annual temperature is about  $-8.5^{\circ}\text{C}$ . Annual mean wind speed is about 4.5 m/s and is predominantly directed down glacier with a directional constancy of about 0.65, a predominant katabatic wind. Throughout the year the sensible heat flux is positive due to a constant surface based temperature inversion. From May to September this temperature inversion is caused by cooling of the surface by long wave radiation while in the summer months the surface temperature is limited by  $0^{\circ}\text{C}$ , the temperature of a melting surface. At the AWS site the amount of melt energy available in the summer months corresponds to about 0.82 m w.e. snow and ice melt. This is less than derived from the observations (1.1 m w.e. of which 0.7 m w.e. is ice melt). This is due to problems with the temperature observations in the summer months resulting in an underestimation of the sensible heat flux towards the surface and consequently an underestimation of the melt flux.